



DIVERSE LEARNERS

in the **Mainstream Classroom**

Strategies for Supporting **ALL** Students
Across Content Areas

- English Language Learners
- Students with Disabilities
- Gifted/Talented Students

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Using Technology to Teach Diverse Populations

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It is late November and the fifth-grade students are shivering as a cold front blows frosty air into the city. Today is José's first day in the United States and his first day in a new school. He smiles shyly at Ms. Contreras, wondering if any students will be able to understand him when he speaks his native language. He struggles to understand what everyone else is talking about, since he has only recently started learning English. Sandra walks by wearing a headset, but her nose is also buried in a novel about a girl who solves mysteries. She has struggled with reading all year, but her teacher found a fantastic book for her about solving crimes (Sandra wants to work for the FBI). She listens to the book on her iPod and follows along as it is read. Andrew sits at his desk immersed in the latest math challenge. He helps everyone in the class with math, but he struggles with writing and avoids any activity that requires writing. Jonathon walks up to the teacher's desk and hands Ms. Contreras his individualized education plan. He needs her signature before he can turn it in to his content mastery teacher. He doesn't see much use for school and wonders if his mother will let him stay home the next day. Ms. Contreras looks out at eighteen different students, diverse in their needs, interests, and skills. Although it will be a challenge, she is determined to engage each child, molding them into enthusiastic learners by the end of the school year. Her eyes wander to the window and she watches the wind whipping the leaves across the playground. Then, glancing at the four computers in the back of the room, she smiles brightly, excited about her idea for reaching out to each student in her class.

Introduction

The convergence of several factors, precipitated largely by the explosive advances in technology, offers the potential to change vastly the face of education just as it has changed the world in which we live. New legislative demands for accountability in technology standards created by the No Child Left Behind Act of 2001, the skills required of the twenty-first-century workforce, the rapidly expanding global economy, students with diverse needs, and a young population with no knowledge of a world without computers or the Internet create a challenging environment in which the modern educator must work. At the same time, technology offers great potential for enabling educators to meet the diverse needs of all learners.

This chapter discusses a constructivist, student-centered approach to learning that addresses the varied needs of learners in the modern technology-enhanced classroom and differentiates the content, process, and product of the curriculum as it relates to technology integration. It also presents a broad overview of technology-infused strategies, including project-based learning, and provides examples of a variety of social networking tools now available in the Web 2.0 environment. (At the end of the chapter are detailed descriptions and links to technology tools and resources.)

Theoretical Foundation

Dewey (1897) described formal education as a social process and schools as the social community in which students learn how to be productive citizens. Without students' processing the world through social activities, Dewey (1916) stated that "formal instruction [would] be merely the subject matter of the schools, isolated from the subject matter of life-experience" (131). This philosophy of education is more relevant to students now than ever before. Today, students are not only members of the local community or society but are also joined through technology to a global community. This global community requires students to use higher-order thinking skills in solving complicated and multifaceted real-world problems.

Indeed, in today's world, "solving complex problems are [sic] no longer left to the few; all individuals whether they are working on an assembly line, or in a corporate think tank, need problem solving skills" (Newby et al. 2000, 6). In order to address the multifaceted educational needs, leaders in the fields of education, business, and government identified six elements that will prepare

students to be successful in work and life in this century (Partnership for 21st Century Skills 2002). They stated that in order to foster learning, it is imperative that schools "emphasize core content, emphasize learning skills, use 21st century tools to develop learning skills, teach and learn in a 21st century context, teach and learn 21st century content, [and] use 21st century assessments that measure 21st century skills" (7). Students need to develop information and communications skills, thinking and problem-solving skills, and interpersonal and self-directional skills. In addition, students need to study the three emerging content areas of global awareness, financial literacy, and civic literacy. While these three areas are not yet part of the traditional curriculum, teachers are able to use technology tools to embed these emerging content areas into the language arts, reading, mathematics, and social studies curricula. Thus, global awareness is reinforced as teachers and students in one country collaborate with teachers and students in another part of the world. Financial literacy can be taught using social collaboration tools that allow students to share in the development of spreadsheets using data that are collected at their school or in their community. Civic literacy can be woven into a project that addresses community, state, national, and even world issues, such as global warming.

To foster the ability to solve complex problems, teachers use a constructivist approach in which students construct their own knowledge based on prior learning and experiences. From this perspective, "learning is determined by the complex interplay among students' existing knowledge, the social context, and the problem to be solved" (Newby et al. 2000, 34). Learning in contexts and learning through interactions with others are two critical components that allow students to construct their own knowledge. Constructivist teachers develop instruction that provides opportunities for learning in contexts that are personally meaningful to the individual, collaborative activities that provide opportunities for students to combine knowledge and share solutions to problems, and opportunities to construct new knowledge while looking for solutions to problems (Newby et al. 2000).

While the constructivist perspective is not new, the availability of a vast array of technology tools facilitates the introduction of real-world problems to challenge all learners in today's diverse classrooms. Indeed, the integration of technology into the "ongoing educational process can play a significant role in creating educational environments that reflect the way people interact with the real world, sharing representational and computational task burdens" (Norton and Wiburg 2003, 34).

Ms. Contreras stays after school a few hours to prepare the learning centers for the next morning. She has already spent the first part of the year preparing students to be

self-directed in their learning. Using inquiry-based strategies, she taught them to look for their own answers and to be just as excited about the hunt as the answers to their questions. She often uses both inductive and deductive lessons, finding that her students learn better when they construct the answers to questions based on their prior learning. Ms. Contreras has been using these information-processing teaching models throughout the year because "they emphasize ways of enhancing the human being's innate drive to make sense of the world by acquiring and organizing data, sensing problems and generating solutions to them, and developing concepts and language for conveying them" (Joyce et al. 2000, 17). Connections to prior learning are reinforced as students seek to understand and make sense of the new materials.

In addition to teaching students about learning, she has also ensured that students who are not proficient on the computer have learned requisite skills for completing the activities. She found at the beginning of the year that some students were adept in using technology while others had little experience. Having assessed her students' knowledge of technology, she now makes sure each student team includes at least one "techie." Each techie is responsible for bringing others in the group up to speed with each type of technology tool. (Although Ms. Contreras is quite proficient with technology, she's found that students generally learn faster from other students.)

Now that the students have the requisite skills for developing a project-based learning lesson, she is ready to nudge them toward being more responsible for their own learning.

She is freezing cold and exhausted as she walks out the door, but she can hardly wait for the next day.

Overview of Project-Based Learning (PBL)

One approach to curriculum that is consistent with a constructivist view of learning is project-based learning, also called problem based-learning. In this teaching model, students construct knowledge through a long-term, real-world project. The Buck Institute of Education (BIE) has developed a model of project-based learning based on creating standards-focused projects that include performance-based assessments. The BIE "defines standards-focused [project-based] learning as a systematic teaching method that engages students in learning knowledge and skills through an extended inquiry process structured around complex, authentic questions and carefully designed products and tasks" (Markham et al. 2003, 4).

Projects can be brief, lasting a couple of weeks, or can run much longer, sometimes becoming the guiding theme for an entire school year. With project-based learning, students are engaged in their learning, often determining the

content that they will learn during the course of the project while solving real-world problems. Because they are developing an authentic product that is relevant to them, students become engaged in the activities. In the project-based classroom teachers interact closely with students, becoming "coaches, facilitators, and co-learners throughout the process" (Markham et al. 2003, 4).

The BIE lists the following components for outstanding projects (Markham et al. 2003, 4-5):

Develop learner-centered lessons, recognizing that students want to learn and want to be taken seriously as learners.

Ensure that students are learning the central concepts and principles of a discipline so that learning can be extended beyond the scope of the project.

Choose issues that are significant at the time and encourage students to delve deeply into the real-world issues.

Include the essential tools and skills, including technology, for learning how to plan and organize in-depth studies into a project.

Require products that solve a problem or answer a question developed through rigorous research and reasoning.

Require several products that will permit feedback, thus encouraging students to "go back to the drawing board" and learn more.

Use performance-based assessments incorporating high expectations that necessitate using a range of skills and knowledge.

Include a collaborative component in the project.

Research suggests that project-based learning is often more popular with students than traditional methods of teaching (Thomas 2000). In addition, project-based learning seems to be equivalent to or slightly better than other models of instruction in producing gains in general academic achievement. Students develop skills in problem solving, organization, collaboration, and decision making. Project-based learning works well in diverse classrooms, because the unique abilities, talents, and preferences of each student are highlighted and emphasized (Thomas 2000). Since standards are a critical component of the BIE project-based learning model, it becomes a powerful method for helping students develop the knowledge and skills they need to be successful in school.

The next morning the students rush into Ms. Contreras' room talking about the snow that fell the night before. It doesn't usually snow in this area, but this year they have

already had several major snow storms. When Sandra raises her hand asking why it is so cold this year, Ms. Contreras invites the students to suggest ideas—it is the perfect beginning for the lesson she planned. Several students start talking about global warming. Jonathon interrupts, “But it is getting colder, not hotter. How can that be global warming?”

Sandra is excited about what the others are saying. It sounds a lot like they are trying to solve a mystery, just like in the book she has been reading. She walks over to the Smart Board saying, “OK, you guys, let’s start brainstorming ideas about why it’s so cold.” She opens the concept mapping software and begins adding information as the students offer many suggestions. Andrew walks up to the Smart Board and asks the others in the class for suggestions on setting up categories for the problem they decide to study. Ms. Contreras stands at the back of the room, occasionally making suggestions as the students begin developing a plan for investigating changes in weather and global warming.

Differentiating Instruction Using Technology

According to Tomlinson (2005), “differentiated instruction provides multiple approaches to content, process, and product” (4). In addition, it is student-centered, assessment-based, and blends whole-class, group, and individual instruction (5). In differentiating content, teachers can either adapt what they teach or adapt the access to content. Technology can be helpful in differentiating content by offering a variety of ways to access learning. Instead of reading a book, English language learners and struggling readers can listen to the book on an iPod. Students can be challenged to learn vocabulary through an online game or can create a vocabulary game for other students.

Differentiating process involves “sense-making . . . [the] opportunity for learners to process the content or ideas and skills to which they have been introduced” (Tomlinson 2005, 79). Processing content provides critical connections for students from which they can more effectively grasp a new idea. Classroom activities that provide the best opportunity for students to make sense of new materials are interesting, encourage students to think critically, and “cause the students to use a key skill(s) to understand a key idea(s)” (Tomlinson 2005, 79). Technology can be helpful in differentiating process by offering a variety of tools that help students make sense of new ideas. Using technology to create and share concept maps allows students to clarify their own connections to the new knowledge. Developing a blog—a personal online diary—about a new idea can provide a way for students to sound out their ideas as they are processing knowledge.

Differentiating products is an excellent way to assess student knowledge, understanding, and skills. In some instances, tests may be eliminated as an assessment and a product used instead. While a product can be fun for the students to develop, its primary purpose is to "cause students to think about, apply, and even expand on all the key understandings and skills of the learning span it represents" (Tomlinson 2005, 85). With the variety of technology tools available today, differentiating products can take many forms, in some cases determined by the students themselves.

Technology Tools for Enhancing Learning

The variety of technology tools available today can enable teachers to provide students with access to a world beyond the classroom. Today's students consider these technology tools as ubiquitous as the previous generation considers television. Prensky (2001) calls this new generation of students *digital natives*, a generation that has "spent their entire lives surrounded by and using computers, videogames, digital music players, video cams, cell phones, and all the other toys and tools of the digital age" (3). In addition, students today can, with seemingly lightning speed, assimilate a new technology, dumping the old one when it becomes no longer essential to their daily lives. In a matter of months, reading email became outdated as text messaging became the preferred mode of communication. Online social collaboration tools such as MySpace and Facebook connect students with others across the world, allowing them to obtain information from experts in the same field. Second Life and other multiuser virtual environments connect individuals from across the world as they meet virtually to play games, topple empires, collaborate on a project, or attend class. Google has now become a verb that means *to look for*, and individuals google topics for information more than 2.7 billion times per month (Sullivan n.d.).

Teachers who use new technology tools in the classroom have found that students are more interested in what they must learn when it is presented in the language they understand. Social collaboration tools such as blogs, wikis, virtual worlds, and web conferencing; media tools such as MP3 players and podcasts; and freely available software for concept mapping, desktop publishing, and data analysis provide opportunities to make diverse classrooms rich in content as well as appealing to the digital native.

The students have decided that they will divide tasks up and develop a time line for completing the project on climate change and global warming. Ms. Contreras shares

an article she read the night before about a “carbon footprint.” The article described a carbon footprint as the effect an individual has on the environment based on his or her carbon dioxide emissions each year (www.carbonfootprint.com/carbonfootprint.html). After discussing the article for several minutes, the students decide that they want to learn more about a carbon footprint. It sounds to them as though they can really make a difference in the climate by making changes in their school and in their community. José still knows many people in El Salvador. He decides to send his uncle, who is a teacher, an email asking him if he would be interested in his students’ collaborating with José’s class in the United States. Using Google Maps, José shows the rest of the class where he used to live. Several other students think it is exciting to talk to others so far away and are curious whether global warming has also affected El Salvador. They decide to join José’s group and hope they can also find ways to make a difference so far away. José volunteers to translate emails from the class in El Salvador if anyone does not understand them.

Andrew wants to look at weather data from the last hundred years to see if there really has been a change in weather patterns. He teams up with others interested in data collection and analysis, and they begin googling sites that contain archived weather data. Their focus is on their town and the town that José comes from; they want to develop charts that are easy to manipulate so they can graphically show any changes in weather. Andrew creates a Google spreadsheet so that students in El Salvador can also enter data about their town’s weather changes over the last hundred years. He also sets up a spreadsheet to start categorizing all the activities that affect the carbon footprint—both positively and negatively.

Sandra has heard her father talking about An Inconvenient Truth and wants to send an email to former vice president Gore asking him to visit their class virtually through videoconferencing tools. Ms. Contreras is not sure Gore will respond and encourages Sandra to find other sources for guest speakers. While Sandra begins drafting a letter asking experts to speak virtually to the class, the students in her group google other experts in the field of global warming.

Jonathon is excited about the plan and feels as though he can finally make a real difference. He begins sketching out a graphic logo for their project and asks if he can set up a page on a wiki for the students in both classes to use for sharing information. It is the first time that Ms. Contreras has seen Jonathon excited about an assignment this year.

Web 2.0 Connections

The students in Ms. Contreras’ fifth-grade class use a number of technology tools that have become available with the development of what is termed Web 2.0.

While there is not a single, easily-grasped definition of Web 2.0, Warlick, an educator, author, and consultant for more than thirty years, describes it this way:

Web 2.0 encompasses a range of emerging web-based applications that are, more than anything else, about conversation. Most often listed are blogging, podcasting, and wikis along with other more specific tools such as VoiceThread. They are each about content building, but each also has the ability to discuss or converse embedded in the application.

These content conversations are subterranean, meaning that participants often do not know who the conversant is, and almost never work face to face. As a result, people participate/collaborate with each other without the baggage of position in the class, perceived biases, or other prejudices. It is empowering to the learner, because it gives voice to what they are learning (D. Warlick, personal communication, December 21, 2007).

Indeed, people do participate and collaborate with others in a way that was virtually unheard of several years ago. For example, for this chapter, I contacted Warlick through his blog site and asked if he would be willing to provide a definition of Web 2.0. He responded almost immediately with an explanation that was focused not only on defining the term, but also on the educational benefits of Web 2.0. This immediate accessibility to experts in the field offers more real-world contact for both teachers and students.

In addition, many of the web-based applications appeal to students who are already knowledgeable about and skilled in using the tools. Thus, the tools have received a great deal of attention in the world of K-12 education. Individuals in the field loosely agree that Web 2.0 encompasses "a more socially connected Web where everyone is able to add to and edit the information space" (Anderson 2007, 3). If one had to come up with a single word to describe this new generation, the word would probably be *connected*. Students today are connected to their peers, to teachers, to role models, to information, to games, to the world. Using the web-based applications inherent in Web 2.0 has become a highly effective method of engaging all students in the learning process.

Ms. Contreras is quite excited about the students' work on the global warming project. She has been able to embed science, math, data analysis, health, history, reading, and writing into the project. In language arts, for example, Texas students in the fifth grade are expected to be able to "frame questions to direct research, organize prior knowledge about a topic in a variety of ways such as by producing a graphic organizer, and take notes from relevant and authoritative sources such as guest speakers, periodicals, or

on-line searches" (Texas Essential Knowledge and Skills—Fifth Grade, n.d., 7). Students in Ms. Contreras' class have the opportunity to conduct primary research and plan strategies for gathering information and making interpretations of the effects of global warming. A variety of additional standards are being addressed throughout the project and offer a more realistic environment in which students can bridge the content with prior learning because they are gathering and analyzing data with real-world significance.

Andrew is teaching students to use spreadsheet software to graph changes in weather over the past century. The students have been using a Google spreadsheet so that his team and the team in El Salvador can add information and collaborate on methods of presenting the results. All students in Ms. Contreras' class now have a good grasp of ratios and percentages, since they are looking at real changes in weather across large time periods. In creating and analyzing spreadsheets containing data students have collected during the project, mathematics standards such as describing "the relationship between sets of data in graphic organizers such as lists, tables, charts, and diagrams; and [solving] problems involving changes in temperature" (Texas Essential Knowledge and Skills—Fifth Grade, n.d., 13) have been covered.

Sandra is not able to get former vice president Gore to speak to the class virtually, but she does receive a response from a NASA scientist and a professor from MIT specializing in climate change, both of whom come to class virtually to share information with the United States and El Salvador students.

After hearing them speak, Sandra wonders if some weather changes could have been the result of changes in the world. Her team begins investigating historical events that may have had an impact on the climate and discover some links to coal mining and deforestation that may have correlated to changes in temperature over the years.

Jonathon sends an email (that Sandra helped him write) to the mayor. He wants to share the class wiki with the members of the city council and see whether they will proclaim May 15 to be Carbon Footprint Day. The mayor has been working on setting up recycling centers and is interested in the environment, so he enthusiastically agrees to come to talk to the class in person. When he sees the wiki that Jonathon developed and the logo for the class project, the mayor asks the city web designer to place a link on the city's web page.

Ms. Contreras has given José an iPod so that he can listen to lectures at home and hear the English language spoken at night. He is rapidly learning English. In addition to learning English, he is learning about different types of animals through the iPod videos that Ms. Contreras downloads from United Streaming and YouTube. He is excited about the topics because he hopes one day to become a zoologist. José is quite popular with the other students, since he is able to help in communicating with stu-

dents in El Salvador. After posting photos on the wiki that Jonathon built, students in both classes learn that they share many things in common. For José, the world becomes a smaller place, and his new country, warm and welcoming.

Web 2.0 Tools in the Educational Environment

In Ms. Contreras' class, students use various technology tools as they complete their projects. Below are brief descriptions of some of the tools that are available to teachers.

Blogs • *Blog* is the portmanteau of web log, an online publishing application that allows individuals to post personal thoughts and insights for those with similar interests to read and comment on. Others can sign up for the blog and receive notice when new information becomes available, thus bringing together individuals with like interests in an online forum. A form of blogging that is becoming popular in schools is for teachers to post student work and invite the students' peers to comment on the writing in this authentic and real-world environment. Since many K–12 schools have been hesitant to allow the use of blogs because of safety concerns, blog sites such as Warlick's blogmeister offer a controlled environment in which students can safely post and communicate. For more information, google *blogs in education, educational uses for blogs, blogging, blogmeister*.

Wikis • A *wiki* is a web-based application that can be viewed by all and edited/modified by anyone with editing privileges. Wikis offer tremendous potential for developing collaborative content by users who do not live and/or work in the same location. Wikis generally have a WYSIWYG (what you see is what you get) interface that enables users who are not familiar with writing programming code to build relatively sophisticated web pages. Wikis can incorporate sound, videos, photos, spreadsheets, tables, and charts into the pages and are cross platform friendly (can be used by anyone who has access to the Internet) regardless of computer operating system or browser used. Because wikis can be edited from any Internet connection, educators who are not physically present in the classroom can still maintain contact with their students (Educause 2005). In addition, the wiki stores a history of who made contributions and what individuals add or delete, making them a valuable resource for collaborative projects. For more information, google *wikis, wikis in education, K–12 education, educational uses of wikis*.

Social Bookmarking (Tagging and Tag Clouds) • *Social bookmarking* is a way to maintain favorite online sites that can be accessed with a single click. In addition, social bookmarks “enable powerful cross-referencing between bookmark owners, providing opportunities to share and [collaborate on] through the web content that is important” (Warlick n.d., 1) to individuals with shared interests. Thus, one person not only can look at his or her favorite locations, but can also see what others with like interests are bookmarking, harnessing the power of multiple individuals working together. One of the most popular sites for social bookmarking is del.icio.us. After joining the free service, individuals can use social bookmarking the same as they do favorites in a browser. Individuals create a tag—a one-word descriptor for a hyperlink. Multiple tags can be assigned to one site and can be edited at any point. Each person can build a storehouse of related information driven by personal interests. A tag cloud includes a list of all tags, with the largest number of tags (most popular) highlighted either by size or by color. For more information, google *tags, tag clouds, social bookmarking in education, del.icio.us, technorati*.

Podcasting • *Podcasting* is a portmanteau of iPod broadcasting. With podcasts, individuals can publish audio and/or video broadcasts online, allowing users to view or listen whenever and wherever it is convenient. While podcasts do not require an iPod for listening, a defining feature of podcasts is access through a subscription feed, called Really Simple Syndication (RSS). Many school districts are using iPods and podcasting to reach their English language learners after school hours; iPods are distributed to ELL students and uploaded with content from classes using teacher lectures, PowerPoint presentations about a subject, or movies from United Streaming, YouTube, TeacherTube or other video-sharing websites. In the evening, students can review lessons and hear English spoken, playing the podcasts repeatedly if needed. Students are also able to record and then listen to their own voice, which is helpful for those who are first learning a new language. For more information, google *podcasting, iPods and ELL, iTunes, podcasting and special populations, uses of podcasting in education, video podcasting, vodcasts, educational podcasts*.

Twitter • Although it is quite new, twittering may prove to be a useful tool for educators. Twitter is a free online service that became operational in March 2007 and enables someone to broadcast short messages—140 characters or less—to a general audience or to a designated group of individuals. Twitter will relay messages via the Internet or through cell phones. Educators who have experi-

mented with Twitter have used it to get class information quickly to students or parents. For more information, google *twitter, twitter and education*.

RSS feeds • RSS stands for Rich Site Summary or Real Simple Syndication. The RSS icon on a blog, wiki, or other content site allows readers to subscribe to and view content without having to go to the site. Instead of having to visit a multitude of individual sites each day to view relevant and interesting information, individuals can use an aggregator or news-feed collector that places the new content into a single folder. An RSS allows individuals to easily subscribe to and aggregate information into a single location. Each individual controls the content by subscribing or unsubscribing to sites based entirely on personal preferences and interests. RSS feeds are beginning to be used extensively in education (Richardson 2005). For more information, google *RSS feeds*.

YouTube • YouTube is a video sharing website that allows users to upload videos and view videos by others. While some think that YouTube is filled with inappropriate movies and absurd rubbish, an incredible number of teachers and students are using this site for educational purposes. Appropriate movies are uploaded for students to view or can be downloaded and then shown to students in class without an Internet connection. YouTube has entered the mainstream as a favorite spot for presidential debates and political commercials. The ease of creating home movies using free or inexpensive video editing software has allowed virtually anyone the opportunity to become a star or director. While YouTube is still generally considered the gold standard in video sharing websites, a number of other companies now offer similar services. For more information, google *YouTube, YouTube in education, TeacherTube, video sharing websites*.

Web conferencing (Skype) • While the tools mentioned previously are generally considered to be asynchronous (users can collaborate without having to be online at the same time), web conferencing tools offer incredible opportunities for teachers and students to meet synchronously. Previously, meeting online for a conference required expensive equipment for connecting and communicating. Today, having a conference online merely requires a computer, headset with microphone, and an Internet connection. Free web conferencing tools, such as Skype and dimdim, which use VoIP technology, allow multiple users to meet via computer at the same time using a combination of text, audio, and video. In this environment, applications, movies, websites, interactive white boards, and other tools can be shared and modified collaboratively. Several commercial web

conferencing tools allow for recording or archiving the conference. Some web conferencing tools, such as Wimba Live Classroom and eLuminate, do charge a fee. Web conferencing offers perhaps unprecedented opportunity for educators: guest speakers from across the world can meet with the class from any location; students from around the world can collaborate, sharing languages, photos, or cultural artifacts, virtually; teachers can collaborate with other teachers and professionals worldwide; students who are homebound can attend class virtually and interact with other students in the class. For more information, google *Skype, dimdim, web conferencing, webconferencing, vyew, Horizon Wimba, eLuminate*.

Creative Commons • One of the most exciting developments for educators is the advent of the Creative Commons copyright license, a movement to allow artists more freedom to determine how their works can be used. Started in December 2002, "Creative Commons defines the spectrum of possibilities between full copyright—*all rights reserved*—and the public domain—*no rights reserved*" (Creative Commons n.d., 1) Creative Commons' licenses allow artists to maintain copyrights to works while encouraging others to copy, distribute, display, and perform, remix, and mashup. "Creative Commons provides free tools that let authors, scientists, artists, and educators easily mark their creative work with the freedoms they want it to carry. [Individuals] can use CC to change . . . copyright terms from 'All Rights Reserved' to 'Some Rights Reserved'" (Creative Commons n.d., 1). Educators are able to find and safely use graphics, photos, music, lesson plans, and more with Creative Commons licensing. For more information, google *Creative Commons, ccmixer, flickr, freesound project*.

Google apps • Google offers a wide array of free online tools for educators, thousands of whom are currently using the tools and blogging about them extensively. One has to search a bit to find all the tools, but the effort yields extensive rewards. On the Google home page, in the upper left corner, click on *More* and then *Even More* to see the list of current tools. Some notable tools are blog search, a tool to find blogs that are of interest; desktop, a program that allows users to search their computers and return results in the same format as Google web results; notebook, a program that allows users to clip and collect information as they surf the web; and blogger, a program that one can use to create a personal or a class blog.

The following tools allow students to collaborate across platforms around the world: Google docs, spreadsheets, and presentations allow students to create and share content online anytime, anywhere; Picasa, an online photo editing and sharing program; SketchUp, a program for building 3D models that can then be added

to Google Earth; Custom Search, which allows teachers to build a search engine that permits students to search only on specific sites (fantastic for ensuring they have reliable and safe sources). Google Earth is a free, downloadable application that “combines the power of Google Search with satellite imagery, maps, terrain, and 3D buildings to put the world’s geographic information at [educators’ and students’] fingertips” (Google Earth n.d., 1). Also, Google Labs’ Experimental Search provides an inside look at what is in development and gives individuals an opportunity to try tools out before they are released to the general public. For more information, google *google labs*, *google experimental labs*, *google docs*, *google timeline*, *google maps*, *google earth*, *google apps*, *google education*, *google body*.

Digital storytelling • Porter (2006) explains that a person who uses digital storytelling takes “the ancient art of oral storytelling and engages a palette of technical tools to weave personal tales using images, graphics, music, and sound mixed together with the author’s own story voice” (1). She further describes it as an emerging art form that enables individuals to “reclaim their personal cultures while exploring their artistic creativity” (1). In addition, the technology component of digital storytelling enables individuals to go outside the realm of traditional linear oral stories.

Digital stories are powerful tools for diverse learners. English language learners become involved in creating digital stories and are more willing to practice oral language skills. Easy to use and free, digital storytelling software is accessible for special education students and offers features that make it challenging for the most gifted students. This fun-to-use software captures the imagination of students and adults alike and becomes a powerful tool for learning content. Because they can be uploaded and saved onto a computer, stories created by students can be easily shared. For more information, google *digital storytelling*, *Photo Story 3*, *Movie Maker*, *Digitales*, *digital storytelling for educational purposes*.

Trends to watch • The Horizon Report, released annually (the 2007 report is available at www.educause.edu/ir/library/pdf/CSD4781.pdf), focuses on trends that have one year or less, two to three years, and four to five years until they are broadly adopted. For later or earlier reports, google *Horizon Report* and the year. Below are few of particular interest:

http://en.citizendium.org/wiki/Main_Page

Citizendium is a new open wiki encyclopedia project that is aimed at credibility and quality.

www.ibm.com/developerworks/library/x-mashups.html

Mashups are interactive web applications that combine media content from a number of sources to create something new.

<http://scratch.mit.edu/>

Scratch is a free programming language developed at the MIT Media Lab. Geared for young people, ages eight and older, Scratch helps students learn mathematical and computational skills while developing enjoyable projects.

www.pachyderm.org/

Pachyderm is a multimedia authoring tool accessed through a web browser that allows users to create interactive, Flash-based multimedia presentations.

<http://secondlife.com/>

Second Life is a 3D virtual world in which residents interact and live a second life. It is a commercial entity. Residents of Second Life spend roughly \$1 million US dollars per day. Businesses and higher education institutions purchase virtual land and conduct business as well as hold classes in this virtual world.

www.whyville.net/smmk/nice

Whyville is a virtual world for children. Boys and girls from around the world go to Whyville to chat, play, and learn together. Unlike Second Life, the site has an obvious educational slant.

At the end of the project, Ms. Contreras found that her students were energized and enthusiastic about learning and were willing to work harder than they had for many of the traditional assignments she had given them in the past. Because accountability was extremely important at her school, Ms. Contreras ensured that activities and products reflected the standards-based components necessary for doing well on the end-of-year assessments. One way that she did this was by having students create assessment instruments in the form of games to test critical concepts. She also had each student produce four pages in the wiki and then use the writing process and peer editing to improve their product. Ms. Contreras found that students wanted to rewrite and edit their papers more extensively than they normally did because the wiki would be read and used by members of the community instead of just the teacher.

On May 15, the city celebrated Carbon Footprint Day. The students in Ms. Contreras' class were the experts who provided information to the city council as well

as to other adults and students who attended the ceremony. Using Skype, a web camera, a computer, a multimedia projector, and a microphone, students in Ms. Contreras' class and the city council members were able to talk live with students in El Salvador during Carbon Footprint Day. Through the student-prepared activities developed during the project, the city council members became more aware of global warming and its impact on the world. They decided to maintain the link to the class wiki on the city website in hopes that citizens would become more conscious of their energy consumption and maintain May 15 as Carbon Footprint Day in the community.

Sandra enjoyed the research component of the project and liked working to solve a mystery. She decided a career in the FBI would definitely be interesting to her and asked Ms. Contreras what else she could do to improve her reading ability. Sandra knew she would have to be a strong reader if she was going to have a career in the FBI. Andrew liked teaching the other students how to create charts and graphs and manipulate data with spreadsheets. He thought he would consider becoming a math teacher. All the students in class agreed that he could tutor them once they got to middle school. Jonathon was able to work closely with the mayor during the project and found something in which he excelled. He continued with the class wiki and agreed to provide some training for the city council members. The mayor told Jonathon that they were really behind in technology and needed some help catching up. Jonathon set up an additional wiki for the city council and was looking forward to teaching adults for a change. José learned more English throughout the year and gained great self-esteem by serving as the interpreter for students in the United States and El Salvador. He wanted to continue learning English and thought he might like a career as an interpreter.

While it had been a long semester and everyone was tired, the students and Ms. Contreras agreed that they had never had more fun learning. In addition to being fun, the project-based learning activity offered each student an opportunity to excel in a variety of ways. Ms. Contreras decided to continue developing project-based learning activities, since she now understood their power in reaching the diverse needs of each student.

Conclusion

Students today will emerge from their K–12 educational experiences into a highly competitive global community. For success in this global community, students must be strong academically as well as skilled in higher-order thinking and problem solving. In addition, they must have the ability to work effectively with others around the globe in a technology-driven world. While using technology in isolation has not been shown to be effective in improving learning outcomes,

technology integrated into the core curriculum offers a powerful tool for enhancing learning and differentiating instructional content, product, and process. In addition, the use of a variety of technology tools offers educators a way in which to address the unique needs and strengths of each student while significantly contributing to the learning process for all.

Applications

1. Think back to when you were in elementary or secondary school and the projects you can still remember. What were the characteristics of the projects and what did you like the most about them? How were they similar to and different from the project-based learning activities described in this chapter?
2. Go to www.edutopia.org and view a movie about one of the project-based learning activities on the site. You can choose something from an elementary school or a secondary school. What did you like about this project? How could you adapt the activity for your classroom? What are some of the challenges you can foresee in attempting this type of activity?
3. Discuss differentiating instruction through content, through process, and through product. How can instruction be differentiated using content, process, and product and maintain rigor and relevance in diverse classrooms? Give an example of each kind of differentiation.
4. Choose four different technology tools and develop a brief outline of a lesson that integrates the selected tools into the instruction.

Web Resources

Wikis

The following wikis offer free services as well as being advertisement free for educators:

<http://pbwiki.com>

<http://wikispaces.com>

www.wetpaint.com This wiki does not offer HTML editing, but has more templates to choose from than the others.

Social Bookmarking

<http://del.icio.us> This social bookmarking service allows you to keep all your bookmarks organized by popularity or most frequent use.

<http://technorati.com/> One of the oldest social bookmarking sites.

www.citeulike.org A social bookmarking service for scholars that extracts citation details and stores them for access anywhere.

www.dig.com Digg is a popular website that emphasizes technology and science content but has recently moved toward more generic content pulling from blogs, videos, and images on the net.

Podcasts

www.apple.com/itunes/ iTunes is a free digital music site that allows you to download, organize, and play music.

www.epnweb.org The Education Podcast Network, podcasts by and for educators.

www.podcastalley.com/podcast_genres.php?pod_genre_id=7 Podcast Alley provides links to a variety of educational podcasts.

RSS Feeds

www.weblogg-ed.com/wp-content/uploads/2006/05/RSSFAQ4.pdf RSS: A Quick Guide for Educators

Video Sharing/Editing Websites

<http://eduscapes.com/hightech/tools/video/video2.pdf> Great article with information on video editing and video sharing websites.

www.youtube.com Video sharing. No rating; so be careful when using with students.

www.teachertube.com/ Specifically for educators; students and teachers can post and use videos.

www.schooltube.com/default.aspx More ads than Teacher Tube, but primarily geared to schools.

<http://eyespot.com> Free video editing and remixing.

www.jumpcut.com You can upload photos, edit, create slideshows, and then share for free.

Web Conferencing

www.skype.com Call computer to computer anytime, anywhere, free.

www.dimdim.com/ Free open source web conferencing service.

<http://vyew.com/content/> Free web conferencing service with limited features; can archive sessions.

www.wimba.com/ Not free, but has powerful features specializing in the education market.

Creative Commons

www.creativecommons.org

Google Apps

www.google.com

Digital Storytelling

www.coe.uh.edu/digital-storytelling/ Comprehensive site on educational uses of digital storytelling.

www.storycenter.org/ Center for Digital Storytelling

Project-Based Learning

www.pbl-online.org/pathway2.html Designing Your Project: Design Principles for Effective Project Based Learning. An online guide that will help you design a project-based learning lesson.

<http://edutopia.org> Site established by the George Lucas foundation contains much information and videos on project-based learning.